8. (Amended) The method according to claim 3, wherein electromagnetic radiation having a frequency of 2.45 GHz is irradiated at an intensity of 1 mW/cm^2 or greater at said step (b).

9. (Amended) The method according to claim 3, wherein said N type GaN compound semiconductor layer is formed by doping an N type impurity to a GaN compound semiconductor.

--15. (New) The method according to claim 3, wherein said thermal energy is approximately 400-500 degrees centigrade.--

REMARKS

Please reconsider the application in view of the above amendments and the following remarks. Applicant thanks the Examiner for carefully reviewing the application.

I. Disposition of Claims

Claims 3-9, and 15 are pending in this application. Claim 3 is independent. The remaining claims depend, directly or indirectly, from claim 3. Claim 3 has been amended to incorporate the limitations of cancelled claim 1. New claim 15 has been added. The addition of claim 15 is supported in the detailed description, for example, on page 8, lines 23-24 of the instant application. No new matter was added by the amendments.

II. Objection(s)

Claim 2 stands objected to based on several informalities. Claim 2 has been cancelled by this reply. Thus, these objections are moot. Accordingly, withdrawal of the

objections is respectfully requested.

III. Rejection(s) under 35 U.S.C § 112

Claim 7 stands rejected under 35 U.S.C. § 112 as indefinite for containing terms that lack proper antecedent basis. Claim 7 has been amended in the manner suggested by the Examiner. These amendments were not made in view of prior art. Thus, this rejection is now moot. Accordingly, withdrawal of the rejection is respectfully requested.

IV. Rejection(s) under 35 U.S.C § 102

Claims 1-9 stand rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 6,429,102 (the '102 patent). This rejection is respectfully traversed.

Claim 3 recites a method for manufacturing a GaN compound semiconductor element comprising the steps of: (a) forming, on a substrate, an N type GaN compound semiconductor layer and a GaN compound semiconductor layer which includes a P type impurity; (b) irradiating electromagnetic radiation of a predetermined wavelength onto said GaN compound semiconductor layer which includes a P type impurity; and (c) activating said P type impurity *by applying thermal energy to said P type impurity* while irradiating said GaN compound semiconductor layer (emphasis added).

As recited in amended claim 3, the thermal energy activates the P type impurity. In contrast, in the '102 patent, the wafer is merely pre-heated to approximately 60 degrees centigrade prior to electromagnetic irradiation. The object of this pre-heating is to "homogenize the temperature distribution across the whole wafer," as described in column 4, lines 21 to 23 of the '102 patent. According to the present invention, on the other hand, in addition to

electromagnetic irradiation, the substrate is also heated so that the P type impurity is activated due to synergy of the electromagnetic energy and the thermal energy. The '102 patent, in which hydrogen is dissociated using only microwave irradiation, is completely silent as to using both microwave energy and thermal energy, as disclosed in the present invention. Advantageously, in embodiments of the present invention, by heating the substrate to a temperature sufficient to activate a P type impurity, hydrogen may be more easily dissociated. In the '102 patent, the object of heating a substrate is to eliminate a variation in the temperature, as described above, and not to supply thermal energy to the P type impurity as in the present invention. As amended, claim 3 recites that thermal energy is applied to activate a P type impurity. The temperatures disclosed by the '102 patent (60 degrees centigrade) are insufficient to do this.

Because the '102 patent fails to show or suggest all of the limitations recited in amended claim 3, claim 3 is patentable over the '102 patent. Dependent claims 4-9 and 15 are allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

V. New claim

Claim 15 has been added to further specify the parameters of the thermal energy applied to the substrate during irradiation. Claim 15 recites that the substrate is heated to approximately 400 ~ 500 degrees centigrade, which is completely different from the temperature range for pre-heating (60 degrees centigrade) disclosed in the '102 patent. This new claim is fully supported by the original specification. No new matter has been added.

V. Conclusion

Applicant believes this reply to be fully responsive to all outstanding issues and place

this application in condition for allowance. If this belief is incorrect, or other issues arise, do not hesitate to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 08228.020001).

Respectfully submitted,

Date: 1/3/03

#45,079

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Marked-Up Version of Title and Claims

IN THE CLAIMS:

3. [A]The method [according to claim 1, wherein said step (b) is performed while heating the substrate.]for manufacturing a GaN compound semiconductor element, comprising the steps of:

(a) forming, on a substrate, an N type GaN compound semiconductor layer and a GaN compound semiconductor layer which includes a P type impurity;

(b) irradiating electromagnetic radiation of a predetermined wavelength onto said GaN compound semiconductor layer which includes a P type impurity; and

(c) activating said P type impurity by applying thermal energy to said P type impurity while irradiating said GaN compound semiconductor layer.

4. [A]The method according to claim [1]3, wherein said step (a) includes the steps of:

(a1) forming a buffer layer on said substrate;

(a2) forming an N type GaN compound semiconductor layer on said buffer layer; and

(a3) forming said GaN compound semiconductor layer which includes a P type impurity on said N type GaN compound semiconductor layer.

5. [A]The method according to claim [1]3, wherein said step (a) includes the steps of:

(a1) forming a buffer layer on said substrate;

(a2) forming said GaN compound semiconductor layer which includes a P type impurity on said buffer layer; and

(a3) forming said N type GaN compound semiconductor layer on said GaN compound semiconductor layer which includes a P type impurity.

6. [A]The method according to claim [1]3, wherein said P type impurity is at least one of Mg, Zn, Cd, Be, and Ca.

7. [A]The method according to claim [1]3, wherein [light]electromagnetic radiation having a wavelength of 4.5 μm is irradiated with an intensity of 0.01 mW/mm^2 or greater at said step (b).

8. [A]The method according to claim [1]3, wherein electromagnetic radiation having a frequency of 2.45 GHz is irradiated at an intensity of 1 mW/cm^2 or greater at said step (b).

9. [A]The method according to claim [1]3, wherein said N type GaN compound semiconductor layer is formed by doping an N type impurity to a GaN compound semiconductor.